UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/786,173	05/21/2001	Nathalie Laurent-Chatenet	136.157	6495

7590 04/23/2004

Patterson, Thuente, Skaar & Christensen, P.A.
4800 IDS Center
80 South 8th Street
Minneapolis, MN 55402-2100

EXAMINER	
LU, TOM Y	

ART UNIT	PAPER NUMBER
2621	9

DATE MAILED: 04/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/786,173	Applicant(s) LAURENT-CHATENET ET AL.	
	Examiner Tom Y Lu	Art Unit 2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-23 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-6,9,10,12-14 and 16-23 is/are rejected.

7)☒ Claim(s) 7,8,11 and 15 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 21 May 2001 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claim 18 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicant fails to define LDL^t in the claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. Claims 1-6, 9-10, 12-14 and 16-18 are rejected under 35 U.S.C. 102(a) as being anticipated by Szeliski ("Motion Estimation with Quadtree Splines", IEEE Transaction On Pattern Analysis And Machine Intelligence, Vol. 18, No 12, Dec. 1996).

a. Referring to Claim 1, Szeliski discloses a) defining an initial model (Szeliski at page 1205, figure 7 shows a coarse nodal representation, which is the claimed "initial model") of finished elements (figure 2 (b) is an example of finished elements) comprising a meshing (an example of meshing is shown in figure 6 (a)) whose nodes are points of the image I_2, a movement vector at each node of said meshing (see figure 6 (a)), and an interpolation formula (page 1201, right column, paragraph 3) for calculating the value of the movement vector of each point of the image I_2 from the values of the movement

vectors of the nodes of the mesh to which it belongs, b) globally optimizing (page 1201, left column, paragraph 3) the values of all the movement vectors of the model according to the differential method (page 1202, left column, equation 5), c) calculating a variation E (page 1202, left column, paragraph 1, "intensity gradient") between the image $\hat{I}_2$ and the image I_2 for each finished element or mesh, d) carrying out a finer meshing (figure 7 shows a medium and a fine nodal representations both are finer meshings) on a discrete fraction of all the finished elements determined according to a criterion relating to the variation E and allocating a movement vector to each new meshing node (page 1202, right column, paragraph 2), e) repeating the steps (b), (c) and (d) on the model of finished elements obtained at the end of the preceding step (d) until a stoppage criterion is satisfied (page 1205, right column, paragraph 3, threshold θ_u).

b. Referring to Claim 2, Szeliski discloses characterized in that so as to carry out a finer meshing on a discrete fraction of all the finished elements in step (d), said set of finished elements is classified in the decreasing order of their variations E and the X first finished elements of this classification are subdivided into smaller finished elements, X representing a predetermined fraction of the number of finished elements of the set (see section 6.1 for subdivision strategy).

c. Referring to Claim 3, Szeliski discloses characterized in that, so as to carry out a finer meshing on a discrete fraction of the set of finished elements in step (d), the set of variations E calculated in step c) is compared with a threshold variation which depends on the size of the finished element in question, and the finished elements whose variation

E are greater than the threshold variation are subdivided into smaller finished elements (section 6.1 in page 1205, threshold is θ_u).

d. Referring to Claim 4, Szeliski discloses characterized in that said stoppage criterion is a predetermined number of finished elements constituting the model of finished elements to be reached at the end step (d) (page 1206, left column, paragraph 2, threshold θ_d is predetermined between 0.25 to 0.5).

e. Referring to Claim 5, Szeliski discloses said stoppage criterion of step (e) is satisfied when the variations E of the set of finished elements of the model obtained at the end of the preceding step (d) are smaller than a functional threshold variation which depends on the size of the finished elements in question (because the nodal representation as shown in figure 7 shows coarse to fine, the variations E of the set of finished elements of the model obtained at the end of the preceding (d) must be smaller than a functional threshold variation which depends on the size of the finished elements in question).

f. Referring to Claim 6, Szeliski discloses in addition for each numerical image I_1 and I_2, a set of R images I_i^r with a level of resolution r and luminance Y_i^r with r taking the values (0,...R-1) and i the values 1 and 2 is defined, the images I_1^0 and I_2^0 corresponding to the numerical images I_1 and I_2, and in that the steps (b) to (e) are carried out for each resolution level r from the level r=R-1 to the level r=0 (Szeliski at page 1200, right column , paragraph 3, teaches implementing motion estimation on a sequence of images, which is the claimed "set of R images").

g. Referring to Claim 9, Szeliski discloses the initial movement vectors are nil vectors.

h. Referring to Claim 10, Szeliski discloses the equation for variation E between the image $\hat{I}_2$ and the image I_2 for each finished element e (equation 3)

i. Referring to Claim 12, Szeliski discloses the differential method for optimizing the movement vectors is the Gauss-Newton method (section 3, page 1200).

j. Referring to Claim 13, Szeliski discloses the differential method for optimizing the movement vectors is the Marquardt extension of the Gauss-Newton method (page 1202, left column, paragraph 1).

k. Referring to Claim 14, Szeliski discloses a compactness constraint is imposed on each finished element at the time of optimizing the movement vectors of the model of finished elements, said constraint consisting of preventing the compactness of each finished element from tending to zero (page, 1205, right column, paragraph 3).

l. Referring to Claim 16, Szeliski discloses the optimization of the movement vectors under constraints on the finished elements is resolved by the increased Lagrangian technique (page 1202, equation 5).

m. Referring to Claim 17, Szeliski discloses the constraints are used in a linearized form in the increased Lagrangian technique (page 1202, equation 6).

n. Referring to Claim 18, Szeliski discloses the methods for optimizing the movement vectors use an LDL^t profile technique.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are

such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Szeliski in view of Moulin ("Application of a Multiresolution Optical-Flow-Based Method for Motion Estimation to Video Coding", IEEE, May, 1993). All the arguments and applicability in Claim 1 are incorporated herein.

a. Referring to Claim 19, Szeliski discloses the fractional subdivision of the meshing carried out in step d) of the movement estimation method is associated with a partially quaternary tree in which each level represents a meshing level and each node represents a square of given level, and in that what is generated is a binary train describing said tree (section 6, page 1204, see figure 8C). Szeliski teaches each node represents a square of given level, not a triangle of given level. Moulin teaches each node in the quaternary tree represents a triangle of the given (see figure 1). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Szeliski by substituting a meshing of squares with a meshing of triangles because both meshings allow the system to locate the motion vectors in the images, one can be substitute of the other.

b. Referring to Claim 20, the combination of Moulin and Szeliski discloses the movement vectors associated with each node of said tree are encoded differentially with respect to the movement vectors of their father node when the latter exists and are ordered in said binary train along a width passage of said tree (Moulin discloses applying quadtree technique to estimate motion vectors in a

sequence of images in video compression. In the compression coding, the father nodes and the children nodes are encoded differently).

c. Referring to Claim 21, the combination of Moulin and Szeliski discloses the fraction subdivision of the meshing carried out in step d) of the movement estimation method is associated with a partially quaternary tree in which each level represents a meshing level and each node represents a triangle of the given level, and in that said tree is generated from a binary train of encoded data describing said tree (see figure 1 in Moulin).

d. Referring to Claim 22, the combination of Moulin and Szeliski discloses the encoded data relating to a given level of the tree are collectively regrouped in the binary train so as to generate the tree level by level as the train is read (section 5 in Moulin).

e. Referring to Claim 23, the combination of Moulin and Szeliski discloses one of ranges belonging to the group of the following range: compression of sequence of images (Moulin discloses compression of sequence of images), compression of data in spaces larger than 2.

Allowable Subject Matter

4. Claims 7, 8 11and 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Claims 7, 8, 11 and 15 incorporate equations, which are not taught or suggested by the art of record.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Zhang et al, U.S. Patent No. 5,477,272, see figure 4.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tom Y Lu whose telephone number is (703) 306-4057. The examiner can normally be reached on 8:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H Boudreau can be reached on (703) 305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Tom Y. Lu

LEO BOUDREAU
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600